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WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

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MEMORANDUM

SUBJECT: **Triazine : Revised HED Residential Portion of the Triazine Cumulative Risk Assessment D317978*.**

FROM: Seyed Tadayon, Chemist
Reregistration Branch 3
Health Effects Division (7509C)

THRU: Catherine Eiden, Branch Chief
Reregistration Branch II
Health Effects Division (7509C)

TO: Diane Sherman, CRM
Reregistration Branch
Special Review And Registration Division (7508C)

* Companion chapter to appendix IV of the Triazine Cumulative Risk Assessment.

This is a revision of the original residential portion of Triazine Cumulative Residential Risk Assessment (S. Tadayon December 19, 2005, D317977). This chapter has been revised to make refinements to CARES ™ assessment.

1. Introduction

For the cumulative risk assessment the EPA's Office of Pesticide Programs (OPP) used the probabilistic model the Cumulative and Aggregate Risk Evaluation System (CARES) to assess cumulative exposures to atrazine and simazine from the these residential use of pesticides.

In nearly all cases, the residential exposure scenarios were developed using proprietary residue and surrogate contact exposure data. Exposure factors such as durations of time spent outdoors were taken from various sources including OPP's Exposure Factors Handbook (USEPA, 1997). For the majority of residential uses considered in this assessment, the full range of exposure values are used, rather than relying on point estimates. While drinking water assessment address only the oral exposure route, the residential assessment considers the dermal and inhalation exposure routes as well as the non-dietary ingestion route, which is based on the mouthing behavior of young children.

Examining the regulatory history of the triazines revealed that the application rate for liquid atrazine residential turf product was lowered to 1 lb ai/A. Application rates for the other turf and golf course products were unchanged.

2. Scope of Assessments

Two out of three triazine pesticides considered in this cumulative assessment have residential uses. Atrazine and simazine have registered uses on lawns and golf courses. Propazine does not have any residential uses and therefore not considered in this CRA. Both atrazine and simazine are registered for homeowner use to control a variety of annual broadleaf weeds and some grassy weeds that are generally specific to the Southeast, primarily Florida, i.e., bermuda grasses.

3. Residential Scenarios

The residential scenarios addressed in this document represent critical triazine uses that have the potential for significant exposure or risk when considered in a cumulative assessment. Minor uses, such as spot treatment, were not considered. A brief description of each scenario is provided below:

a. Lawn Care

Atrazine and simazine (adult applicator and adult and child post application exposure)

Atrazine and simazine may be applied by homeowners or professional lawn care operators

(LCO). Granular and sprayable applications can be made by consumers using push-type spreaders and hose-end sprayers, respectively. Dermal and inhalation exposure was assessed for homeowners mixing, loading, and applying atrazine and simazine to residential lawns as a broadcast application. This assessment also considered dermal post-application exposure for adults and children contacting treated lawns. Additionally, oral non-dietary exposure was considered for toddlers transferring treated-turf residues from their hand to their mouth.

Post-application exposure was assessed for the broadcast use of atrazine and simazine.

b. Golf Course

Atrazine and Simazine (adult and teenager post-application exposure)

Atrazine and simazine are used on golf course turf**.** Golf course workers may apply liquid or granular formulations as a broadcast application to fairways, greens and tees. Post-application exposure was assessed for adults and teenagers playing rounds of golf on courses treated with the sprayable formulations of atrazine or simazine.

4. Exposure Routes/Scenarios Considered

The routes of exposure considered in this cumulative assessment varied depending on certain application and post-application exposure activities that were determined to be age group-specific. Since cumulative risk assessments do not include occupational risks, applicator exposure is not assessed for the golf course scenario. However, EPA does perform separate occupational risk assessments for such exposure scenarios. The specific exposure routes and pathways/scenarios are summarized in Table 1 and described in additional detail below:

Table 1 Specific Exposures Routes and Pathways/Scenarios							
Scenario	Population	Applicator			Post Application		
		Oral	Dermal	Inhalation	Oral	Dermal	Inhalation
Lawn/Turf	Adults		X	X		X	
	Children 1-2				X	X	
	Children 3-5				X	X	
Golf Course	Adults					X	

a. Oral Route of Exposure

Toddler ingestion via hand-to-mouth activity was the only oral route of exposure considered in the residential portion of this assessment. Specifically, oral non-dietary exposure ingestion was considered only for children 1-2 and 3-5 years old for the lawn care scenario and was based primarily on behavioral observations of young children. OPP acknowledges that there are very limited data on exposure to young children; in general, however, children ages six and older no longer exhibit mouthing behavior to the degree seen in younger children. In addition, while OPP recognizes that non-dietary exposure may occur not only from hand-to-mouth activities but also from activities such as ingestion of soil and mouthing of grass, the latter two pathways were not considered because they had little impact on exposure when addressed in the individual chemical risk assessments.

b. Dermal Route of Exposure

The dermal route was assessed for adults applying consumer pesticide products to lawns. For both children and adults, post-application dermal exposure was assessed for the lawn scenario. Dermal post-application exposure also was assessed for adults and teens playing golf on treated courses.

c. Inhalation Route of Exposure

Inhalation exposure was assessed for adults applying pesticide formulations to lawns.

5. Data Sources

Three basic types of data were considered in this assessment: pesticide use data, and exposure contact factor data. These data are described in more detail below. The HED assumptions used for the model input treated the likelihood of co-occurrence between the turf scenario and the golfer scenario independently. However, when this assumption is coupled with the pesticide use data described below, it is unlikely that potential exposure is underestimated.

a. Pesticide Use Data

The proabilistic models require residential pesticide use inputs to aggregate exposure from multiple use scenarios. For the triazine residential assessment, it was assumed that pesticide application had equal likelihood of occurring on each day of the week, as well as each month of the year. Based on the currently registered labels, it was assumed that a maximum of two (2) applications would be made to residential lawns, and a maximum of two applications would be made to golf course greens, tees, and fairways. Additionally, each application would be effective for up to 30 days. The percent of households applying the various products was assumed to be **ten** percent of the population. These assumptions are expected to provide a conservative assessment of residential exposure and risk.

b. Exposure Factor (Contact) Data

Exposure factors such as the amount of time spent in an area, frequency of hand-to-mouth contacts, size of area treated, and location of residue source (lawn) are critical for estimating exposures to a given substance. Appendix IV of the Triazine Cumulative Risk Assessment (CRA) contains a summary of all exposure factors used in the Triazine CRA, as well as the derivation of various distributional parameters.

c. Residue Concentration Data

There are chemical-specific turf transferable residue (TTR) data for the liquid formulations of atrazine and simazine, and granular formulations of atrazine for assessing dermal exposure.

6. Exposure Scenarios

This assessment considered a variety of exposure scenarios for consumer applicator and post-application exposures. Each of these is described in additional detail below. Since it is difficult to determine typical rates for homeowner products, OPP used the maximum application rate (2 lbs ai/A for granular atrazine, 1 lb ai/A for liquid atrazine, 2 lbs ai/A for liquid simazine and 1.8 lb ai/A for granular simazine) , as allowed by currently registered labels, to assess exposure for all scenarios. The regulatory history of the triazines is discussed in the introduction. For the lawn care exposure scenarios, the model inputs assumed the value of two applications per year, and for golf courses, the model inputs assumed the value of two applications per year.

a. Lawn Care Exposure Scenarios

i. Lawn Applicator Exposure

Both atrazine and simazine have registered lawn care uses. There are two formulations of atrazine and simazine that are available for lawn use: granular and liquid sprayable formulations. Applicator exposure was assessed for homeowners mixing, loading and applying a variety of atrazine and simazine products to their lawns.

Total applicator exposure is calculated as the product of the unit exposure (UE) (either dermal or inhalation), the application rate, and the lawn size.

Unit Exposures: Both dermal and inhalation exposure routes were considered. ORETF studies were used for the granular and liquid broadcast treatment scenarios.

The ORETF (Outdoor Residential Exposure Task Force) submitted a report (Klonne, 1999) in which a variety of products were used on turf. In these studies, both homeowners and lawn care operators (LCOs) were monitored following broadcast applications to turf. All of the data submitted in this report were completed in a series of studies.

The two studies that monitored homeowner exposure resulting from granular spreader (Klonne, 1999/OMA003 Study) and hose-end sprayer (Klonne, 1999/OMA004 Study) applications were used in this assessment. Volunteers participating in these exposures studies were adult non-professionals who use pesticides on their own gardens and lawns. Many of the volunteers selected as subjects in these studies were members of garden clubs. All volunteers made their applications without specific instruction from the study investigators. Unit exposures estimated from these studies cover various clothing scenarios that range from wearing short pants and short sleeved shirts, to long pants and long sleeved shirts.

All dermal and inhalation unit exposure were normalized and expressed as milligrams exposure per pound of active ingredient handled (mg/lb ai) (referred to as unit exposures, or UE). The lognormal distributions of the UEs for the lawn applicator scenarios are shown in Table 2.

Table 2 Lognormal Distributions of Unit Exposures Used for Triazine Lawn Care Scenarios

Application Method	Exposure Route	Unit Exposure Distribution (mg/lb ai)
Granular Rotary Spreader	Dermal	LN(0.809, 0.570)
	Inhalation	LN(0.0013, 0.0013)
Hose -end spreader	Dermal	LN(8.44, 26.2)
	Inhalation	LN(0.022, 0.040)

NOTES:
LN(μ, σ) represents a lognormal distribution with μ = mean and σ = standard deviation.
for lawn scenarios, information was derived from data and studies conducted by the ORETF (Outdoor Residential Exposure Task Force).
A more detailed explanation of the statistical analysis of this data is provided in Appendix IV

Application Rates: OPP used the maximum application rate (2 lbs ai/A for granular atrazine, 1 lb ai/A for liquid atrazine, 2 lbs ai/A for liquid simazine and 1.8 lb ai/A for granular simazine) , as allowed by currently registered labels, to assess exposure for all scenarios.

Area Treated: An important variable for estimating home-owner applicator exposure is the size of the lawn. OPP considered the average and median lawn sizes reported in a journal article by Vinlove and Torla (1995). The means and medians were ~13,000 ft^2. However, the authors noted problems interpreting the data since it is based primarily on low income houses and consists of adjustments of the lot size by the house's foundation (footprint) only. The data do not consider other structures such as decks or other green space such as gardens, which can reportedly reduce the lot size by up to 50%. Similar lawn sizes were noted in ORETF study (Johnson, 1999) with similar problems encountered with respect to confounding variables such as decks and other green spaces. For this assessment, OPP used a uniform distribution for lawn size bounded by 1000 ft^2 and 20,000 ft^2. The lower end of this range considers smaller lawns for residences such as town houses. The upper bound of 20,000 ft^2 (~ ½ acre) appears reasonable given the type of application equipment assumed to be used by residential applicators.

ii. Lawn Post-Application Dermal Exposure

The fate of pesticides applied to turf, and subsequent human contact, is a key variable for assessing post-application dermal exposure and can be an important exposure pathway to consider as part of a cumulative assessment. This exposure pathway was evaluated here in the Triazine Cumulative Risk Assessment by using data from a number of available studies (described in more detail below). Briefly, post-application dermal exposure (mg pesticide) is calculated by multiplying the residue concentration on the lawn (mg/cm^2) by the transfer coefficient (cm^2/hour) derived from literature and other studies and the time spent on the lawn (hours/day).

Residue Data: There are chemical-specific turf transferable residue (TTR) data for liquid formulations of atrazine and simazine, and for granular formulations of atrazine for assessing dermal exposure.

MRID 449580-01. *Determination of Transferable Residues on Turf Treated with Liquid Atrazine.* The dry-flowable formulation (Atrazine® 90DF) was applied to Bermuda grass turf in Georgia (using a backpack sprayer) and North Carolina (using a tractor mounted sprayer). The study quantified turf-transferrable atrazine residues collected on cloth sheeting. The test site with highest residue was selected (North Carolina). **On day zero TTR values of 0.219 (ug/cm^2) at 50% and 1.32 (ug/cm^2) at 100 % were used for triazine cumulative assessment.** (See a full description of the study in appendix iv)

MRID 449588-01. *Determination of Transferable Turf Residues on Turf Treated with Atrazine Applied in a Granular Fertilizer Formulation.* Scott's Bonus S Weed and Feed®, a granular fertilizer product containing 1.1 percent atrazine, was applied to turf in Georgia and Florida, and the effect of subsequent irrigation on residue levels was examined. The study quantified turf-transferrable atrazine residues collected on cloth sheeting. The test site with highest residue value was selected (Georgia site) TTR values from both irrigated and non-irrigated plots on day zero were used. **Input granular TTR values of 0.0744 (ug/cm^2) at 50% , 0.0585 at 100% were used for triazine CRA.** (See a full description of the study in appendix iv)

Therefore, test sites were set up near Mount Dora (Lake County) Florida, and near Madera (Madera County) California to represent humid and dry climatic regions, respectively. Turf varieties treated were *Floratum* (a *St. Augustine* type) in Florida and *Common Bermuda* in California. Turf age in Florida was approximately 8 months, and in California, four years.

MRID 449587-01. *Determination of Transferable Residues on Turf Treated with Liquid Simazine.* The liquid formulation (simazine Princep® 4L) was applied to *Floratum* (a *St. Augustine* type) in Florida and *Common Bermuda* in California. The study quantified turf-transferrable atrazine residues collected on cloth sheeting. The test site with highest residue was selected (Florida). **On day zero TTR values of 0.305 (ug/cm^2) at 25%, 0.319 (ug/cm^2) at 50% and 0.477 (ug/cm^2) at 100 % were used for triazine cumulative assessment.** (See a full description of the study in appendix iv)

Transfer Coefficients (TC): The transfer coefficients used in this assessment were developed by dividing the hourly dermal exposure (µg/hour), (obtained from a set of activities in the dermal exposure studies), by the measurement commonly referred to as turf transferable residues (TTR) (µg/cm^2).

Transfer Coefficients used to assess children's exposure to treated lawns: A study by Black (1993), which investigated dermal exposure values of young children who were exposed to a non-toxic substance, was used to estimate exposure contact factors for children contacting treated lawns. In this study, children performed unscripted activities on turf treated with a non-toxic substance used as a whitening agent in fabrics. The subjects of the study were 14 children aged four to nine years old. In this study, children were provided toys and their activities were recorded as they performed unscripted activities for a period of one half hour. Activities recorded were grouped into the following classifications:

- Upright (standing, walking, jumping and running)
- Sitting (straight-up, cross legged, kneeling, crouching and crawling)
- Lying (prone or supine)

Dermal exposure was measured by fluorescent measurement technology described in Fenske et al., (1986). Measurements on various body parts were expressed as ug/body part (e.g., hand, face, etc.) and as concentration (ug/cm^2).

In a second study (Vaccaro, 1993) in which a liquid formulation was used, eight adults performed structured activities intended to mimic a child's activities (including walking/running, sleeping, crawling, and sitting on turf).

The subjects performed these activities for a period of four hours beginning four hours after the turf had dried. Turf had been treated earlier with a sprayable form of chlorpyrifos and exposure was estimated in the study by monitoring the amount of a chlorpyrifos metabolite – excreted over the following period of 6 days. This method directly measured internal dose and was used to back-calculate a generic "to the skin" transfer coefficient by using chemical specific dermal absorption data for chlorpyrifos (Nolan et al., 1984).

These concentrations were normalized to represent the surface area of children three to four years of age for use with a standardized body weight of 15 kg. Standard surface area values were taken from the Agency's Exposure Factors Handbook (EFH), (USEPA 1997). The transfer coefficients used in this assessment were estimated from this study.

For children's dermal post-application exposures to treated lawns, the triazine cumulative assessment used a lognormal distribution of transfer coefficients from Black (1993) and Vaccaro (1993) noted above. The lognormal distribution is represented by a mean of 5700 cm^2/hour and a standard deviation of 3600 cm^2/hour. The lognormal distribution was truncated at the calculated 99th percentile of the distribution (i.e.,18700 cm^2/hour for the spray application) This was done in order to avoid a distribution which contained values that were well beyond those deemed reasonable. ***A 24% reduction in the 3-5 year old transfer coefficient was used to justify the differences of body surface areas between 1-2 year and 3-5 year old.***

Transfer Coefficients used to assess adult exposure to treated turf: The Vaccaro (1993) study detailed above also was used to estimate TCs for adults.

For adult post-application dermal exposures to treated lawns, the triazine cumulative assessment used a distribution of transfer coefficient characterized by a lognormal distribution with a mean of 9,400 cm^2/hour and a standard deviation of 4500 cm^2/hour for the spray application. The lognormal distribution was truncated at the calculated 99th percentile of the distribution (i.e. 25000 cm^2/hour).

Duration: Another important variable for addressing post-application exposure from home lawn treatment is the duration of time spent on lawns. In this triazine CRA, cumulative distributions of durations on lawns of up to two hours were used to address adult exposure on lawns. These data are presented in Table 15-64 of the EFH (USEPA, 1997); however, OPP notes that the percentiles above the 95th have the same values (121 minutes). A similar cumulative distribution was given for children ages one to five. In order to be protective of children and to address the uncertainty in the upper percentiles of the exposure factor data, OPP selected an empirical distribution (which was expressed as a cumulative distribution function) from the EFH's Table 15-80 with a bound of 3.5 hours for children. This distribution represents the amount of time spent outdoors rather than just on lawns. This adjustment allows for additional time that children may spend outdoors (such as parks and schools) where there is potential for additional contact with treated turf.

iii. Lawn Non-Dietary Hand-to-Mouth Exposure

The assessment also incorporates exposure resulting from toddler hand-to-mouth activity on lawns. Briefly, exposure through this pathway is calculated as the product of the following factors: residue concentration (mg/cm^2)' hand-to-mouth contact frequency ($hour^-$), surface area of inserted hand parts (cm^2), saliva extraction efficiency (unitless), wet hand adjustment factor (unitless), and hours spent on lawn (empirical distribution).

Residue Data: The TTR data used to estimate hand-to-mouth exposure is the same as that used to estimate dermal post-application exposure for residential turfgrass. **The standard assumption of 5% DFR was replaced by 1.1% for granular hand-to-mouth transfer based on atrazine-specific data. This assumption is based on triazine hand press data as described below:**

Hand press Data: There is chemical- specific hand press data (MRID# 456223-11, *"Detemination of Dermal Tramsfer Efficincy of Granular Atrazine Residues From Turf to Dry and Wetted Palms"*). This study, which was modeled after the published research by Jackie Clothier (May, 2000), generated a total of 88 hand press samples and allowed for the evaluation of the impact on a single hand press versus multiple hand presses; wet hand transfer versus dry hand transfer; and irrigation versus no irrigation. The greatest amount of residue transfer was seen following wet hand presses on non irrigated turf, with the transfer efficiency similar for both single and multiple presses. The mean wet hand press transfer efficiency was **1.1%** of the application rate equivalent to 0.25 ($\mu g/cm^2$) based on the maximum application rate of atrazine (2 lbs ai/A). These data were used to assess non-dietary ingestion.

Frequency of Mouthing Behavior: For the triazine CRA assessment, the frequency of hand-to-mouth events is based on residential SOP, 2001. Reed et al., (1999) reported hourly frequencies of hand-to-mouth events in pre school children aged 2 to 5 years based on observations using video tapes. The data consist of 20 children at daycare centers and 10 children at home. A range of 0 to 70 events per hour were reported. The 1999 SAP recommended the use of the 90th percentile value of 20 events. A mean of 9.5 events was also reported by Reed, which is similar to the mean reported by Zartarian et al., 1995 and 1997 using similar video tape techniques while observing 4 farmworker children (2-4 years). Based on a triangular distribution of 0, 10 and 20 was assumed for this assessment.

Surface Area of Hand Mouthed (cm^2): The triazine CRA relied on revised residential SOP (2001) analysis of surface area of hand mouthed. The February 1999 Scientific Advisory Panel (SAP) suggested that each hand-to-mouth event consists the insertion of 1 to 3 fingers. The same SAP also suggested the use of a palmar surface area (both hands) of 114 cm^2 . This value is consistent with values reported for children ages 37 to 42 months (111 cm^2) and 43 to 48 months (116 cm^2) by Snyder (1975). The problem of assigning surface area values to the palms and fingers was solved by Gurunathan (1998) who simply dividing the palmar surface area of the hands by 2, with each half representing the palms and palmar surface of the fingers. Since the hand-to-mouth has been defined by the SAP as 1 to 3 fingers (5.7 to 17.1 cm^2) a screening level of 20 cm^2 was selected based on the assumption that each hand-to-mouth event equals 3 fingers. A criticism of hand-to-mouth frequency data based on video tapes is that it is not clear if the counting of hand-to-mouth events are based on finger insertions or if the hands were simply located near the mouth (Kissel et al., 1998). A triangular distribution of 0, 10 and 25 was assumed for this assessment.

Saliva Extraction Factor: To address the removal of residues from the hands by saliva during mouthing events, It has been recognized in the literature that there is incomplete removal of residues on the hands by hygiene washes using water, surfactants, ethanol, or isopropanol (Fenske and Lu, 1994; Kissel et al., 1998; Wester and Maibach, 1989). These, references suggest removal efficiency as low as 10%. Camann et al., 1995, investigated the use of surgical sponges wetted with human saliva to remove residues from hands of volunteers. Removal efficiency of 50 percent by saliva was reported for the pesticides chlorpyrifos, poperonyl butoxide and pyrethrin. Thus, for screening purposes, the value of 50% is used in triazine CRA.

Duration: The time spent on the lawn was estimated as a cumulative distribution ranging from 0 hours to 3.5 hours. To be protective of childrens' exposure and to address the uncertainty of the upper percentiles of the exposure factor data, OPP selected a cumulative distribution from EFH (USEPA, 1997) Table 15-80 with a bound of 3.5 hours for children 1 to 5 years old. This distribution represents the amount of time spent outdoors. This allows for the time that children spend outdoors not only at home but also in parks and near schools.

Assessing exposure through the non-dietary ingestion pathway is difficult due, in part, to issues associated with measurement of the above-discussed variables as well as issues associated with the utility of using children's hand-to-mouth frequencies based on indoor activities for outdoor exposure scenarios. There are also differences in mouthing behavior based on active and quiet play with increased mouthing likely to be during activities of quiet play. Limited data evaluated by Groot et al., 1998 suggests that children aged six to 12 months (exceeding 160 minutes per day) can experience longer durations of mouthing activities than children 18 to 36 months (up to 30 minutes per day). However, children in this age group are not likely to be engaged in post application lawn activities OPP is modeling that would result in higher estimated exposure. Additional data for very young children (under the age of two) are needed to delineate the frequency differences between hand-to-mouth events for children engaged in active and quiet play.

b. Golf Course Scenario

i. Post-Application Dermal Exposure

Atazine and simazine are also used on golf courses. The application rate for liquid and granular atrazine is 2 lb ai/A and the application rate for liquid simazine is 2 lb ai/A while the application rate for granular simazine is 1.8 lb ai/A. The current assessment addresses dermal post-application exposure for adults and teens playing rounds of golf on treated courses. Post application exposure was estimated as the product of turf-transferable residue (mg/cm^2), transfer coefficient (cm^2/hour), and time spent in the activity (hours).

The *1992 Golf Course Operations: Cost of Doing Business/Profitability* survey conducted by the Center for Golf Course Management (CGCM) was used to establish the percent of individuals playing golf. The CGCM survey reported that an average of 12% of the population plays golf. A conservative assumption of 10% represents the likelihood of playing golf on a triazine treated golf course.

Residue Data: Liquid and granular TTR data used to assess post-application exposure for the lawn care scenario was also used to assess risk for this scenario.

Transfer Coefficients: The surrogate data used to derive transfer coefficients were based on two measurements of four individuals playing golf on two golf courses treated with chlorothalonil (Ballee, 1990), and the exposure of golfers (four volunteers) to flurprimidol (Moran et al, 1987). For both studies, an assumed transfer efficiency of 1% was used to calculate the transfer coefficients, since the studies were conducted using spray-able formulations. Based on these two studies, a lognormal distribution with a mean of 480 cm^2/hour and a standard deviation of 160 cm^2/hour was used to represent the transfer coefficient. This distribution was truncated at the calculated 99th percentile value of 960 cm^2/hour.

Duration: The exposure duration for individuals playing golf was assumed to be a uniform distribution bounded at the low end by two hours and at the upper end at four hours. The four-hour value was obtained from the CGCM survey.

RESIDENTIAL AGGREGATE RISK ASSESSMENTS AND RISK CHARACTERIZATION

For assessing the risks from incidental oral, dermal, and inhalation exposures, HED selected the developmental no observed adverse effect level (NOAEL) of 6.25 mg/kg/day based on delayed puberty (delayed preputial separation) in male rats as the endpoint from a 28-day pubertal study in rats. The oral NOAEL of 6.25 mg/kg/day was adjusted for dermal exposure by use of a dermal absorption factor of six percent from a human study to provide a dermal NOAEL of 104 mg/kg/day. To match the toxic effect with the appropriate exposure duration, a 28-day rolling average of exposure was calculated. Risks associated with residential exposures are expressed as Margins of Exposure (MOEs). The target MOE of 300 or more was selected for residential exposures based on a 10X UF for intraspecies variation, and a10X UF for interspecies variation, and an additional 3X for concerns regarding the effects of atrazine and simazine on the development of the young. MOEs greater than 300 for adult and children do not exceed HED's level of concern, i.e., are not of concern. Table 3 presents the 28 days rolling average exposure (mg/kg/day) and risk (MOE) estimates from CARES model when residential exposures are cumulated.

Table 3. Estimated Exposures and Risk from Residential Scenarios					
95th Percentile		**99th Percentile**		**99.9th Percentile**	
Exposure	**MOE**	**Exposure**	**MOE**	**Exposure**	**MOE**
Toddlers 1-2					
0.00000000	**>1000000**	**0.00099**	**6,311**	**0.01182**	**529**
Toddlers 3-5					
0.00000000	**>1000000**	**0.00080**	**7,794**	**0.01061**	**589**
Male 20-49					
0.000016	**379,214**	**0.00055**	**11,466**	**0.00458**	**1,365**
Female 13-49					
0.0000223	**279,081**	**0.00073**	**8,585**	**0.00620**	**1,007**

For the adult populations, residential exposure comprises applicator exposure for homeowners applying triazine products to their lawns, as well as post-application exposure related to re-entering treated lawns or golf courses. At all percentiles of exposure, the MOE are well above the level on concern of the adult populations.

The application of pesticides is one of the more straight-forward activity patterns to measure since it represents easily defined activities. As a result, exposure contact data used to assess exposures during application of consumer-oriented pesticides are the most robust information used in the residential portion of this assessment. Recent data generated by the Outdoor Residential Exposure Task Force (ORETF) have been used to assess the use of hose-end sprayers (lawn care products), and rotary granular spreaders (lawn care products). The unit exposure value for rotary granular spreader is based on 30 replicates consisting of individuals using a push-type rotary spreader. A number of clothing scenarios are possible to be generated from these data. In this assessment short-sleeved shirt and short pants were assumed. This may overestimate exposure as large portion of exposure is to the lower legs. Although a surrogate compound was used, exposure is believed to be more influenced by the type of equipment used rather being chemical specific. OPP has high confidence in these data. The assumption for area treated is a difficult variable to estimate. However, the assumption is reasonable given the application equipment used. Although, it may underestimate areas that have larger lawns.

The current assessment also addresses dermal post-application exposure for adults playing rounds of golf on treated courses. The liquid and granular TTR data used to assess post-application exposure for the lawn care scenario was also used to assess risk for this scenario. Since golf course turf are intensively maintained (watered and mowed every day), this residue data is assumed to overestimate residues on treated golf course turf. The exposure duration for individuals playing golf was assumed to be two to four hours per day, based on information obtained from a 1992 survey conducted by the Center for Golf Course Management. These assumptions are expected to adequately estimate potential exposure for golfers.

For the toddler populations, residential exposure is assessed for children contacting treated lawns. Both dermal and nondietary ingestion exposure is expected. All MOEs are above the level of concerns at the 95th and 99th and 99.9th percentiles of exposure.